

However, errors in each bit have a different impact on the error in N_0 the reconstructed speech sample. Find the mean-squared error between the transmitted and received amplitude.

4. In the digital case, the recovered speech signal can be considered to have two noise sources added to each sample's true value: One is the A/D amplitude quantization noise and the second is due to channel errors. Because these are separate, the total noise power equals the sum of these two. What is the signal-to-noise ratio of the received speech signal as a function of p_e ?
5. Compute and plot the received signal's signal-to-noise ratio for the two transmission schemes as a function of channel signal-to-noise ratio.
6. Compare and evaluate these systems.

Problem 6.16: Source Compression

Consider the following 5-letter source.

Letter	Probability
a	0.5
b	0.25
c	0.125
d	0.0625
e	0.0625

1. Find this source's entropy.
2. Show that the simple binary coding is inefficient.
3. Find an unequal-length codebook for this sequence that satisfies the Source Coding Theorem. Does your code achieve the entropy limit?
4. How much more efficient is this code than the simple binary code?

Problem 6.17: Source Compression

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